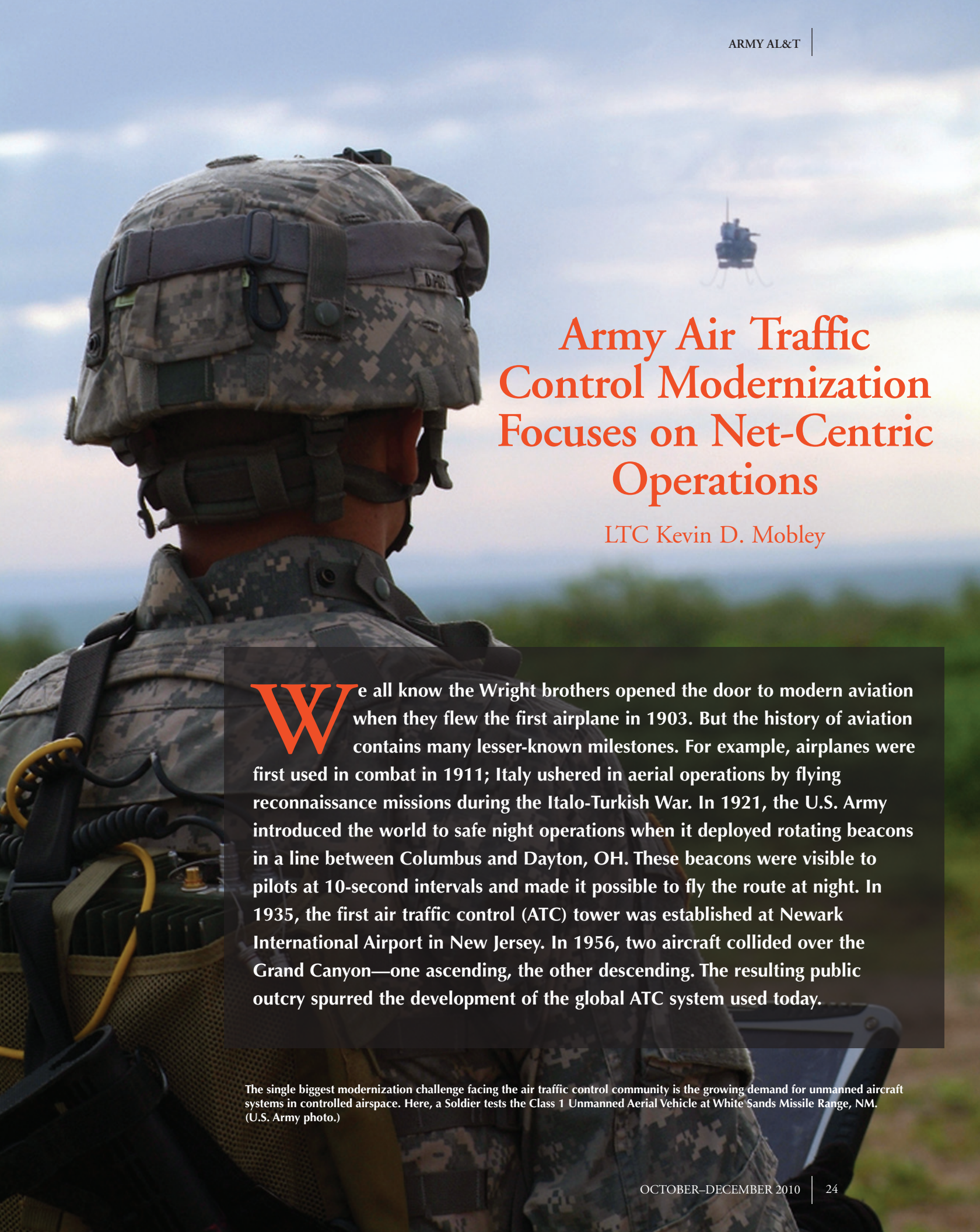

Army Air Traffic Control Modernization Focuses on Net-Centric Operations

LTC Kevin D. Mobley

We all know the Wright brothers opened the door to modern aviation when they flew the first airplane in 1903. But the history of aviation contains many lesser-known milestones. For example, airplanes were first used in combat in 1911; Italy ushered in aerial operations by flying reconnaissance missions during the Italo-Turkish War. In 1921, the U.S. Army introduced the world to safe night operations when it deployed rotating beacons in a line between Columbus and Dayton, OH. These beacons were visible to pilots at 10-second intervals and made it possible to fly the route at night. In 1935, the first air traffic control (ATC) tower was established at Newark International Airport in New Jersey. In 1956, two aircraft collided over the Grand Canyon—one ascending, the other descending. The resulting public outcry spurred the development of the global ATC system used today.

The single biggest modernization challenge facing the air traffic control community is the growing demand for unmanned aircraft systems in controlled airspace. Here, a Soldier tests the Class 1 Unmanned Aerial Vehicle at White Sands Missile Range, NM. (U.S. Army photo.)

Throughout the 60-year history of Army ATC, one thing has remained both constant and consistent: the systems that support the ATC mission. Although software is updated as it is modernized, the Army air traffic systems of today largely perform the same tasks as their predecessors, and they remain physically similar. The primary reason for the static nature of ATC's physical evolution is that the basic designs simply have not required change. ATC systems are iconic and instantly recognizable in both civilian and military versions at airports, airfields, and heliports worldwide. Like Howitzers and battle tanks, they have withstood the test of time and require little more than updating the technology to remain relevant.

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Army Tactical Air Traffic Control

The four primary Army ATC facilities and mission areas are tower, ground controlled approach and surveillance radar, flight following and airspace management, and expeditionary terminal control. These missions are the same in peacetime and wartime environments.

The organization charged with developing and supporting the Army fixed-base and tactical systems necessary to support the ATC mission is Product Manager ATC Systems (PM ATC). PM ATC is a chartered acquisition organization under Program Executive Office Aviation and Project Manager Aviation Systems. It supports Army airfields worldwide with tactical ATC systems that enable safe operations of Army, joint, and civil aircraft.

The tactical ATC systems of today's Army are much more diverse and provide capabilities well beyond those of the traditional ATC separation and control functions. Recent combat operations generated the need for more diverse mission sets and an expanded set of ATC requirements. One of the primary issues facing the Army's ATC community today is the complexity of the airspace and continued safe operation over combat zones. In concert with the Army's modular redesign efforts, Airspace Command and Control (C2) nodes within the Army Air-Ground System received significant attention regarding the improvement of airspace management over tactical areas of operation.

Key DOD and Army initiatives, directives, and elements driving today's modernization and development include "net-centric" operations, interoperability, information assurance (IA), and information enterprise architecture. The introduction of unmanned aircraft systems (UAS) into controlled airspace has required that software and process upgrades move forward rapidly. The DOD Information Enterprise Architecture provides a common foundation to support accelerated transformation to net-centric operations.

The Product Manager Air Traffic Control Systems (PM ATC)-managed Digital Airport Surveillance Radar is a common sight at both military and civilian airports. (Photo courtesy of PM ATC.)

The Mobile Tower System uses the latest in air traffic control digital technologies to better support U.S. Army tactical aviation. (Photo courtesy of PM ATC.)

A System of Subsystems

Modern ATC systems are responsive not only to DOD but also to Federal Aviation Administration (FAA) standards, mandates, and requirements. To better understand ATC modernization efforts, it is vitally important to realize that while the Army has a "system-of-systems" approach to battlefield C2 architecture, the key to ATC programs and platforms is a "system of subsystems." Each ATC platform consists of multiple subsystems, the most important being radios, automation, and sensors.

Given that communication between controllers and aviators is a principal task for ATC, it is easy to identify radio communications as the most critical capability; ATC band radios are the foundation of all Army ATC platforms. The move from analog to digital communications and the transition to software-defined radios marked a giant step forward in the controller's ability to make all necessary contacts. The future of ATC involves modernizing radio capability by migrating to the Joint Tactical Radio System on all ATC platforms.

Interoperability is the cornerstone modernization requirement for all military programs. ATC is a nondenominational service, provided to civil and military users alike worldwide. ATC facilities, systems, and support must be provided both at traditional airfields and at forward-deployed battlefields worldwide. This single requirement comes with a level of complexity not found with most other systems. Simply stated, each ATC platform must be able to communicate and interact with all aircraft, regardless of where that platform is located, while interfacing with other ATC and battle command systems. The magnitude of complexity comes into focus when we remember that all military, civilian, domestic, and international requirements and mandates must be met. Failure to adapt a platform to emerging requirements can result in a system being denied entry into an airspace.

Net-centric can be defined as enabling connectivity in the system-of-systems network architecture, wherein one system interacts or shares information with another system or platform.

These systems are typically connected through a wireless or direct physical connection. Net-centric connectivity is possible only by incorporating mandated information assurance regulations and requirements.

Future Technology

The DOD ATC community works hand-in-hand with the FAA. Consequently, the FAA's Next Gen program is being closely monitored. Next Gen is shifting the focus from uncooperative surveillance ground-based platforms to cooperative surveillance emanating from the aircraft. Aircraft self-reporting their positions will not only facilitate the transition from ATC to air traffic management but will also allow for a reduction in ground-based legacy sensors, including radar and secondary surveillance radars.

The AN/FPN-67 Fixed-Base Precision Approach Radar serves as the U.S. Army's primary aid to recover aircraft to fixed-base airfields during adverse weather. (Photo courtesy of PM ATC.)

Another key component of the Next Gen is a transition to space-based navigation. In addition to aircraft self-reporting position data, they will have the capability to conduct precision approaches using horizontal and vertical guidance provided by Global Positioning System satellites and refined by ground stations. This technology will integrate into Army ATC once the combat developer requirement is approved, the joint services come to agreement on common implementation, and adequate resources are designated for integration, testing, training, and support.

Advances in automation have added capabilities to platforms far beyond those imagined at inception. One example is the Tactical Airspace Integration System (TAIS). TAIS provides airspace managers with a powerful tool for accomplishing the Army C2 mission, a mission that can no longer be accomplished using traditional tactics—fixed altitudes, preplanned routes, and static control measures that reserve huge blocks of airspace for long periods of time.

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Originally envisioned and designed as a modern tactical flight-following facility, TAIS has grown to encompass airspace C2, dynamic airspace management, and a migration from a complex operating system to a commonly used and understood commercial product. As the Army's system of record for airspace management and en-route air traffic services, TAIS provides automated tools to plan, deconflict, synchronize, integrate, and execute operations in the third dimension of the battlefield for manned, unmanned, civilian, and military aircraft.

TAIS determines conflicts between sets of airspaces and between airspaces and terrain, providing the planner with decision aids to develop, execute, and monitor the airspace plan in accordance with the commander's risk parameters.

TAIS also provides near-real-time situational awareness of the air picture, received through Tactical Digital Information Links, Blue Force Tracker, myriad radar feeds, and operator-generated flight-following tracks; it constantly checks the position of these air platforms against active airspaces and alerts the TAIS operator when the boundaries of active airspace measures are penetrated.

The single biggest modernization challenge facing the ATC community is the growing demand for UAS in controlled airspace. Integrating unmanned and manned aircraft in the same operational environment poses unique challenges to the ATC community as a whole and the military in particular. Successfully managing the combined use of controlled airspace will take the science of ATC to the next level of technical and procedural development.

The Voice Communications Switching System exemplifies the ongoing modernization of ATC fixed-base operations. (Photo courtesy of PM ATC.)

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